RECOMMENDATION APPLICATION FOR SEARCH OF ORNAMENTAL PLANTS USING SENSOR TECHNOLOGY ON ANDROID PLATFORM

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ABSTRACT

One of the characteristics of ornamental plant based on the place of life, the selection of plants that fit with their surroundings will make plants grow more optimal, yet many people do not know what plants fit in with its environment. One of the benefits of taking care of ornamental plants can provide economic value, but in fact the criteria of ornamental plants that are on the market are not in accordance with the wishes of the consumer. To solve the problem, researchers conduct research utilizing the technology of geotagging, location based service, and sensors. Where is the sensor used is the humidity, temperature, and ambient light sensors, this sensor will be the third detected and the application will recommend plants that fit with their surroundings. This research has the main objective, namely to recommend ornamental plants in accordance with environmental criteria and desired by the user, and provides convenience to users in order to promote ornamental plant.

Keyword : Geotagging, Location Based Service, Ambient Light Sensor, Humidity Sensor, Temperature Sensor, Android

1. INTRODUCTION

One of the characteristics of ornamental plants can be distinguished based on physical and venue live ornamental plants, plant identification with both physically and horticulture, then the selection, management and ornamental plants penepatan would be more appropriate and fit, as well as the function of the plant will be more optimal. But the lack of public knowledge about it is certainly becoming a problem, where the quality of growing ornamental plants will be less than optimal. [1]

Take care of ornamental plants is one hobby that much sought after and have many benefits, one of which, namely the business. Rukmana explains in his research, the demand for ornamental plants continues to increase over time, so that it becomes a promising business opportunities because of the many enthusiasts who love ornamental plants [2]. But it will become an obstacle for someone who is not a business person but have the desire to be able to promote its own ornamental plants.

Business development of ornamental plants full of competition demanding businessmen engaged in the business of selling houseplants have knowledge about consumer behaviour towards purchasing decision ornamental plants. To that end, producers need to see consumer behavior in purchasing, because of the characteristics of a desirable ornamental plants are not entirely the same as the consumer characteristics produced by manufacturer [3] .

From the results of the questionnaire data, acquired three major problems. The first problem showed that as many as 83.5 percent stated that the respondents did not know what plants will fit in with environmental conditions. Then the second issue, a total of 78.8 percent stated that the problems experienced by IE they don't know should be memproosikan hiasnya plant where, due to lack of information or service providers that have special facilities for promoting ornamental plants. The third problem that is as much as 45.9 percent stated that considerable difficulties and 42.4 per cent stated the difficulty of finding ornamental plants with criteria in accordance with his wishes.

Of the problems that have been presented then needed a solution that is building an application with the goal can help problems in recommending search ornamental plant, using the technology of geotagging, location based service, and the sensor, which is on the android, where this application will assist users in finding plants that comply with the environmental conditions and the desired criteria, this application also can help users to promote ornamental plant.

2. CONTENT OF RESEARCH

2.1 Theori Of Research

the theory aims to give an overview of the theory and research resources – the theory relating to the construction of the system. The cornerstone of the theory will be discussed, namely in the form of a foundation theory regarding the ornamental plant technology, android, geotagging, location based service, censorship, and the web service.

2.1.1 Ornamental Plants

Ornamental plants are plants that can meet the needs of psychological, improve the environment, and has a value of satisfaction as a hobby. The plant and its beauty effect broad imagination and rekindle the spirit self. The presence of plants in the environment can give the effect of humanizing and can help restore health condition of mind burdened with grief, pain, and problems. Functionally, the ornamental plants can help update the aerial oxygen, help reduce pollutants. Ornamental plants have many types, ornamental plants which will be used for the application of this recommendation, namely the type of flower ornamental plants, ornamental plants, ornamental plant leaf hydroponics and plant ornamental pendants [4].

2.1.2 Geotagging

Geotagging is the process of adding identification to various media such as photos, videos, websites, SMS, or RSS feed in the form of geospatial metadata. These data usually consist of latitude and longitude coordinates (latitude and longitude). Other data may also include altitude, distance, accuracy data, and place names. It is typically used to provide Geotagging photos [5].

Base for geotagging is positions. This position will, in almost every case, is derived from the global positioning system (GPS). Formally known as GPS Navigation Satellite Timing and Ranging (NAVSTAR) the actual GPS was developed for military purposes. Due to the popularity of navigation capabilities and because the GPS technology could be accessed by small appliances that are not too pricey then the Government makes this system able to be enjoyed by the civilians [5].

2.1.3 Location Based Service

Location Base Services (LBS) a service that provides information based on the user's position (device) as the main reference. Currently LBS is used in various contexts such as health, object search, entertainment, work and others. Two main elements in LBS [6]

1. Location Manager (API Maps)
   Providing tools for sources or sources for LBS, the Application Program Interface (API) provides the facility to display or manipulate maps.
2. .Location Prividers (API Location)
   Provide location search technology used by the device. Location API is related to GPS data and real time location data.

2.1.4 Sensor

Sensors are tools that can be used to measure, analyze, monitor a condition and then respond to changes around it. This tool can be found on modern devices such as smartphones with android operating systems, as smart phones that have advanced technology[7].

In this research, used three types of sensors that exist in the category of environmental sensors or Environmental Sensors, including::

1. Ambient Light Sensor

The ambient Light Sensor is a device used to regulate the brightness of the screen automatically based on the light around. In addition, it also serves as a sensor for measuring light intensity counters or in our area, so that the sensor will detect and display the intensity of incoming light. The following is the position of the ambient light sensor, can be seen in Figure 1.



Figure 1. Ambient Light Sensor

2. Temperature Sensor

Temperature Sensor is a device used to measure the temperature of the surrounding environment. Air temperature is a State of hot or cold air in one place at a given time, which are influenced by the large number or at least accepted solar heat Earth. Climate factors determine growth and crop production, when the plant is grown outside the region the climate is, then its productivity often is not as expected. [8] the following is a picture of the temperature sensor, can be seen in Figure 2..



Figure 2. Temperature Sensor
Referench :
http://inpomu.blogspot.co.id/2016/01/berbagai-macam-sensor-dan-fungsinya.html

3. Humidity Sensor

Humidity Sensor is a device used to measure humidity in the surrounding environment, these sensors suitable for measuring humidity levels around so that a plant can match. The air humidity is the amount of water vapor content in the air. Water vapor content in the air varies depending on the suhun the higher the temperature, the more water

vapor content [9]. The following is a comparison between the temperature and humidity, can be seen in Figure 3.

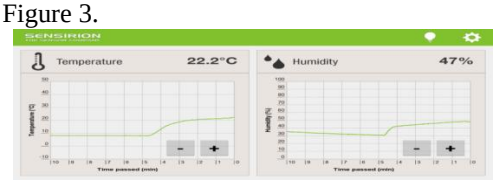


Figure 3. Comparison of temperature and humidity

2.1.5 Web Service

Web service is a software system designed to support the interactions that could operate machine-to-machine over the network. Web service has a liaison instrument elaborated within the machine-processable format (specifically WSDL). Other interconnected systems with the Web service in the manner specified by the description that uses SOAP messages, typically conveyed using HTTP with an XML serialization, along with other related standards with the web.

To perform its functions, the web service requires. The agent is part of the software or hardware devices that send and receive messages. Agents can be written in different programming languages. And can alternate programming languages with the same functionality. The goal of web services is to provide some function on behalf of its owner, a person or an organization such as a business or an individual. The provider entity is the person or organization that provides the appropriate agent to implement a specific service. Requester entity is the person or organization that wishes to use the web service provider entity [10].

2.2 Design abd Analysis System

At this stage consists of the stages of the research done. The stage consists of a general overview of the application, the analysis of system architecture, technology and design of analysis system

2.2.1 General Description Of The System

A general overview of the application that will be created can be seen in Figure 4.

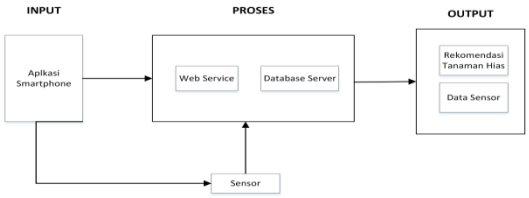


Figure 4. General Description Of The System

In general the workings of the application that is started from a user (user) then the application will send the request in accordance with the selected by a user, if the request is in the form of data sensors then the application will detect the first sensor in the smarphone users, then the application will get the data in the form of sensor data once it is sent to the web service. If another request will then be submitted directly to a web service and then be sent to the database, then the output of the process is data recommendations ornamental plants seuai user options and data sensors.

2.2.2 Architecture System

System architecture analysis aims to identify the architecture to be built. The following figure 5 is the system architecture of the application recommendations search ornamental plants.

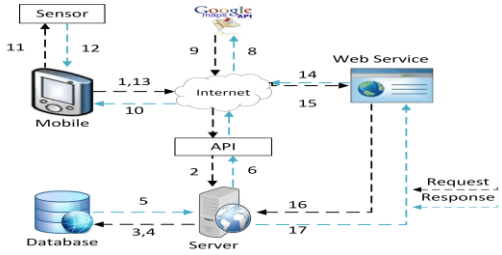


Figure 5. Arcitecture System

The following explanation of the above system architecture picture.

The application will send the request to the server through the internet, if the requested location request form then the server will send it to the google API and then sent back, if the application request form data in a database, then via the internet application will send the request to the web service is then dikrimkan to a database via a server and will send you a response in accordance with the request, if it is requested in the form of sensor data , then the application will send the request to the sensor after that will send the response data to the sensor is.

2.2.3 Geotagging Technologi Analysis

Geotagging is the process of adding information position of GPS data (latitude and longitude) in a digital photo. With geotagging information in digital photos, then the user can know the layout of the photo shooting. the workings of geotagging implemented on this research can be seen in Figure 6 below..



Figure 6. The Workings Of The Geotagging

Specify the coordinates of the point location when GPS enable, then the application automatically saves the data tagging the images on photo EXIF. Photos that have been taken will be saved through the path to be sent to the server. In addition to taking pictures directly, the user can also select an existing photo. After that the path and location information is sent to the server. The next process can add

additional information on tagging photos. Then the server will send all data to the database in order to fit later on when other users looking for plant information will appear in the google maps based on the location of its existence.

2.2.4 Location Based Service (LBS) Technology Anakyss

When the user wants to perform a search based on the location of the plant while he was then the diterapkanlah basic principles of application in order to be able to recommend LBS location the existence of the plant near the location of users, the working principle of adapaun LBS is applied to the application can be seen in Figure 7 as follows.



Figure 7. The Workings Of The Location Based Service

Specify the coordinates of the point location by activating the GPS so that applications can detect the presence of the user. After the location is known then the via the internet application will perform the request to the Google Maps API as a provider. The request is done in the form of request a map based on the location of the current user, and when the request was successfully received, Google Maps will soon respond to applications by providing access to the map application. In addition when location made it known, then via the internet application will also do a request to the web service to retrieve the data in the database that match the search criteria, a request from the application last modified into query by web service then sends the response JSON data as requested by the Web Service. After that, the app will recommend the presence of ornamental plants that fit the user's approximate location.

The following is a script to grant permission in order for the application folder, the print can be seen in Figure 8.

```
<uses-permission android:name="android.permission.INTERNET"></uses-permission>
<uses-permission android:name="android.permission.ACCESS_FINE_LOCATION"></uses-permission>
<uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION"></uses-permission>
```

Figure 8. Script For Access Location

While the script to get the nearest location while users are using the technology as it exists on the LBS Figure 9.

```
*/
private void initLokasi() {
    list_lokasi.add(new Lokasi(-6.29826d, 106.82024d, 1,
            "RM Padang Sari Mande"));
    list_lokasi.add(new Lokasi(-6.28326d, 106.82324d, 2,
            "RM Padang Sederhana"));
    list_lokasi
            .add(new Lokasi(-6.29326d, 106.83324d, 3, "RM Padang Garuda"));
}

/**
 * Initialize the map to the LinearLayout.
 */
private void initMap() {
    mapView = (MapView) findViewById(R.id.mapview);
    mapView.displayZoomControls(true);
    mapView.getController().setZoom(15);

}

/**
 * Initialize the location manager.
 */
private void initLocationManager() {
    locManager = (LocationManager) getSystemService(Context.LOCATION_SERVICE);

    locListener = new LocationListener() {
        // method ini akan dijalankan apabila koordinat GPS berubah
        public void onLocationChanged(Location newLocation) {
            tampilkanPosisikeMap(newLocation);
        }

        public void onProviderDisabled(String arg0) {
        }

        public void onProviderEnabled(String arg0) {
        }

        public void onStatusChanged(String arg0, int arg1, Bundle arg2) {
        }
    };
    locManager.requestLocationUpdates(LocationManager.GPS_PROVIDER, 0,
            1000, locListener);
}
```

Figure 9. Script For LBS

2.2.5 Analisis Teknologi Sensor

In this study, the sensors used i.e. ambient light, temepature and humidity sensor. The third sensor will generate a data in the form of a recommendation of the plants that are suited to the surrounding environment, where data are obtained from the sensor a number but the user will only get the recommendation name of its vegetation..

1. the Ambinet Light sensors, in this research is used to measure the intensity of light, where the accuracy of results is affected by factors such as the brightness of the screen brighter screen help to pendeteksiannya. Units used for the intensity of light is Lux, where this unit is a unit of metric sizes of light on a surface.
   The following is a script to get the data from the sensors, ambient light sensor, can be seen in Figure 10.

```
public class Test extends Activity implements SensorEventListener{

 private SensorManager mSensorManager;
 private Sensor mLight;

 @Override
 public void onCreate(Bundle savedInstanceState) {
  super.onCreate(savedInstanceState);
  setContentView(R.layout.main);

    mSensorManager = (SensorManager)getSystemService(SENSOR_SERVICE);
          mLight = mSensorManager.getDefaultSensor(Sensor.TYPE_LIGHT);

 }
 @Override
 protected void onResume() {
  mSensorManager.registerListener(this, mLight, SensorManager.SENSOR_DELAY_NORMAL);
  super.onResume();
 }
 @Override
 protected void onPause() {
  mSensorManager.unregisterListener(this);
  super.onPause();
 }
 public void onAccuracyChanged(Sensor sensor, int accuracy) {
   if(sensor.getType() == Sensor.TYPE_LIGHT){
    Log.i("Sensor Changed", "Accuracy :" + accuracy);
   }

 }

 public void onSensorChanged(SensorEvent event) {
  if( event.sensor.getType() == Sensor.TYPE_LIGHT){
   Log.i("Sensor Changed", "onSensor Change :" + event.values[0]);
  }

 }
}
```

Figure 10. Script For Ambient Light Sensor

2. Temperature and Humidity sensor is detecting a temperature and humidity environment or room, the units used on the sensor is ° C for temperature and% for humidity, where both of these components will mutually berhungungan, if the temperature is higher then the humidity will be the lower as well as vice versa..

The following script to get data from the sensor temperature and humidity can be get the following in Figure 11.

```
public class SensorActivity extends Activity implements SensorEventListener {
  private SensorManager mSensorManager;
  private Sensor mPressure;

  @Override
  public final void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main);

    // Get an instance of the sensor service, and use that to get an instance of
    // a particular sensor.
    mSensorManager = (SensorManager) getSystemService(Context.SENSOR_SERVICE);
    mPressure = mSensorManager.getDefaultSensor(Sensor.TYPE_PRESSURE);
  }

  @Override
  public final void onAccuracyChanged(Sensor sensor, int accuracy) {
    // Do something here if sensor accuracy changes.
  }

  @Override
  public final void onSensorChanged(SensorEvent event) {
    float millibars_of_pressure = event.values[0];
    // Do something with this sensor data.
  }

  @Override
  protected void onResume() {
    // Register a listener for the sensor.
    super.onResume();
    mSensorManager.registerListener(this, mPressure, SensorManager.SENSOR_DELAY_NORMAL);
  }

  @Override
  protected void onPause() {
    // Be sure to unregister the sensor when the activity pauses.
    super.onPause();
    mSensorManager.unregisterListener(this);
  }
}
```

Figure 11. Script For Temperature and Humidity Sensor

As for step data retrieval from all three sensors can be seen in Figure 12.

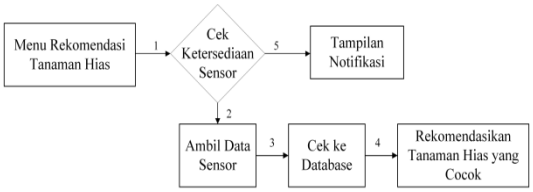


Figure 12. How To Work The Sensors

Select menu recommendations ornamental plants that exist in the application, then the application will check the availability of sensors is needed by the application. If all the sensors required are available, then the application will retrieve data from each sensor. If the sensor data has been obtained then the application will request data to the database to match the right data obtained from sensors with existing data in the database. After the data has been obtained, then the application will recommend ornamental plants suitable for the user environment. However, if the requested sensor is not available then the application will provide a notification that the sensor is not available.

The following is a case study that has been made to get the recommendation of ornamental plants using sensors. Suppose that in an environment of obtained data from the sensors can be seen in table 1 as follows.

Table 1. Data Sensors

Sensor	Range
Humidity	75.5%
Temperature	28.5°C
Ambient Light	25

While the app has a database where these databases have flowers as in table 2 as follows.

Table 2. Flowers Data

Nama Tanaman	Humidity (%)		Temperature (°C)		Ambient Light (Lx)	
	Min	Max	Min	Max	Min	Max
Begonia	50	75	15	30	21.575	26.909
Melati	50	80	24	30	21.575	26.909
Kaktus	30	50	16	26	26.909	26.909

Data from table 2 above has obtained data from the master data that have ornamental plants comply with censorship, after data from the sensors and the data will then be made ornamental plants matching data. Data matching is done by making a query in the table flowers and products, so that the data sought fit with data obtained on a sensor. Suppose we have a table in the form of a table of products, where the contents of the table products as in table 3 below.

Table 3. Product Data

Flowers	Seller	Price
Begonia	MAP Florest	35.000

The third table is made from one query to get the data matching, interest can be seen in Figure 13 as follows.

```
SELECT  * FROM bunga
JOIN produk ON   produk.`jenis`=bunga.`nama_bung`
JOIN penjual ON produk.`email`=penjual.`email`
JOIN jenis ON bunga.`id_jenis`=jenis.`id_jenis`
WHERE '$amb' BETWEEN temp_min
  AND temp_max
  AND '$hum' BETWEEN hum_min
  AND hum_max
  AND '$amb' BETWEEN amb_min
  AND amb_max
  AND jenis.`id_jenis`='$jenis'";
```

Figure 13. Script Query

From the query results obtained results as in table 4 as follows.

Table 4. The Query Results.

Nama Tanaman	Nama Penjual	Harga	Humidity (%)		Temperature (°C)		Ambient Light (Lx)	
			Min	Max	Min	Max	Min	Max
Begonia	Map Florest	35.000	50	75	15	30	21.575	26.909

C. Use Case and Class Diagram Android Mobile Application

Diagram usecase of mobile applications that are built consisting of 11 functional, i.e. registration, Login, Profile, sell ornamental plants, Ornamental Plants capture images, see images of ornamental plants, see all the Flowers, look for the nearest Locations, based on interest rate Recommendations based on Neighbourhood, Take location Data via API, and retrieve Data sensors.

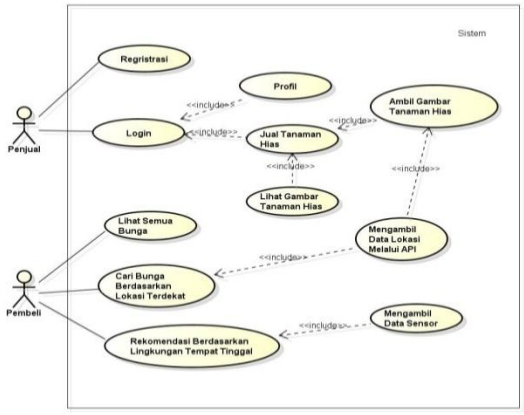


Figure 14. Usecase Diagram

While the class diagram of the android mobile applications to be built can be seen in Figure 15.

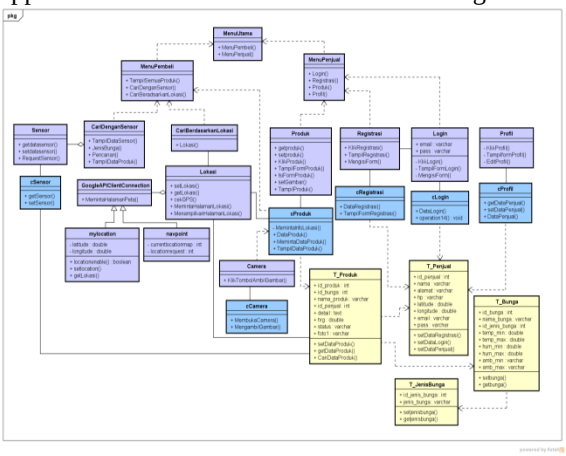


Figure 15. Class Diagram

2.2.5 Implementation System

Implementation stage is the stage where the application recommendations android-based ornamental plants ready to be operated. This step will also explain the implementation of hardware, software implementation, and program implementation and interface applications android-based ornamental plant recommendations.

A. Hardware Implementation

Hardware used to build the system in mobile platforms and websites for application Recommendations Search ornamental plants can be seen in table 5

Table 5. Implementation Hardware

No.	The Type Of Hardware Description	Description
1.	Processor	Quad-core 1.2 GHz
3.	RAM	3 GB
4.	Sensor	Ambient Light, Temperature, dan Humidity
5.	Memori	RAM 1 GB
6.	Processor	Intel Dual Core – 2.4 Ghz
7.	Harddisk	320 GB
8.	VGA	VGA 512 MB

B. Software Implementation

Software (software) for the system implementation process includes the operating system and browser, IDE, text editor for writing code. Table 6 is a software implementation that is used to build application Search ornamental plant Recommendations on mobile platforms and websites.

Table 6. Implementation Software

No	Software Implementation
1	Sistem Operasi Windows 7, 64-bit.
2	Browser Google Chrome
3	IDE Android Studio 2.3.3
4	Android SDK API 4.0 (Level 14)
5	Text Editor Sublime Text 3

C. Implementation Aplication

The application of the recommendations of this ornamental plants must use the humidty sensor mimiliki smartphone, ambient light, and temperature. So that the process can be don3

Implementation Interface

The interface is a means for the user to interact with a system that has been built. Antamuka implementation of this application as follows.

1. The main menu interface on the application of recommendation ornamental plants can be seen in Figure 16 as follows.

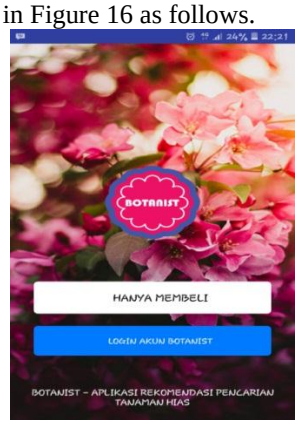


Figure 16. Main Menu

2. The Buyer's Menu Interface
   Interface to the menu for the buyer on the application of recommendation search ornamental plants can be seen in Figure 17 below:



Figure 17 Menu Display Buyers

3. Search interface based on Sensors
   This interface has a function to search for ornamental plants that fit with our environment. The displays can be seen in Figure 18.

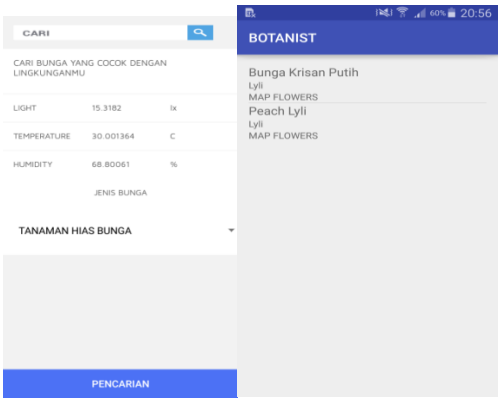


Figure 18. Tampilan Pencarian Berdasarkan Sensor

D. Testing System

Testing is done in order to find errors and deficiencies in the software being tested. Testing is intended to find software that is made whether it meets the criteria in accordance with the purpose of software design. Testing is done by black box testing techniques that focus more on finding functional fault program.

Black Box Testing is done for the functional components Registration, Login, Profile, Ornamental Plants Selling, Take Figure of Ornamental Plants, View Figure of Ornamental Plants, View All Flowers, Find Interest by Nearest Location, Recommendations Based on Neighborhood Neighborhood, Retrieve Location Data Through API, and Retrieving Sensor Data. From the results of pengujain black box can be concluded that this application is quite successful to run as expected.

In addition, the test was also conducted using Likert scale in the form of questionnaires distributed online to 20 respondents, the following is the result of the questionnaire testing that has been done can be seen in Table 7 for testing on users as buyers and Table 8 for testing on users as sellers.

Table 7. User Statement as Buyer

Pernyataan Pertama : Aplikasi ini memberikan rekomendasi dalam pencarian tanaman hias yang cocok dengan lingkungan Saya				
SS	S	RR	TS	STS
9	7	3	1	0
Rata-Rata = (45+28+9+2+0)/20 = 4,2				
Pernyataan Kedua : Aplikasi ini memberikan rekomendasi dalam pencarian tanaman hias yang sesuai dengan kriteria yang Saya inginkan.				
SS	S	RR	TS	STS
7	9	4	0	0
Rata-Rata = (35+36+12+0+0)/20 = 4,15				
Pernyataan ketiga : Tampilan aplikasi ini cukup menarik.				
SS	S	RR	TS	STS
5	11	3	1	0
Rata-Rata = (25+44+9+2+0)/20 = 4				
Pernyataan Keempat : Aplikasi ini menggunakan bahasa yang mudah dipahami				
SS	S	RR	TS	STS
6	10	4	0	0
Rata-Rata = (30+40+12+0+0)/20 = 4,1				
Pernyataan Kelima : Aplikasi ini mudah dipahami dan digunakan.				
SS	S	RR	TS	STS
5	9	4	2	0
Rata-Rata = (25+36+12+4+0)/20 = 3,85				
Rata-Rata Akhir = (4,2+4,15+4+4,1+3,85)/5 = 4,06				

Table 8. User Statement as Seller

Pernyataan Pertama : Aplikasi ini memberikan kemudahan dalam mempromosikan atau menjual tanaman hias yang Saya miliki.				
SS	S	RR	TS	STS
9	8	3	0	0
Rata-Rata = (45+32+9+0+0)/20 = 4,3				
Pernyataan Kedua : Tampilan aplikasi ini cukup menarik.				
SS	S	RR	TS	STS
3	13	4	0	0
Rata-Rata = (15+52+12+0+0)/20 = 3,95				
Pernyataan Ketiga : Aplikasi ini menggunakan bahasa yang mudah dipahami				
SS	S	RR	TS	STS
6	10	4	0	0
Rata-Rata = (30+40+12+0+0)/20 = 4,1				
Pernyataan Keempat : Aplikasi ini mudah dipahami dan digunakan.				
SS	S	RR	TS	STS
2	14	2	2	0
Rata-Rata =(10+56+6+4+0)/20 = 3,8				
Rata-Rata Akhir = (4,3+3,95+4,1+3,8)/4 = 4,03				

Based on the results of beta testing on Table 7 and 8 it can be taken several conclusions of test results are:

1. This application provides recommendations in the search for ornamental plants that match the environment.
2. This application provides recommendations in search of ornamental plants in accordance with the criteria.
3. This application provides convenience in promoting or selling ornamental plants.

4. The application is easy to use and the language used is easy to understand.

3. CLOSING

The conclusions and suggestions obtained from the results of this study are:

3.1 Conclusion

Based on the results of research, analysis, system design, and Implementation and testing system, can be concluded as follows:

1. This application can recommend ornamental plants that match the environment.
2. Application of recommendation of this ornamental plant can recommend ornamental plants in accordance with the desired criteria.
3. This application can provide convenience in promoting ornamental plants owned.

3.2 Suggestion

Applications are designed later can be developed again by adding some features to find more details of ornamental plants that want, besides that because the important point of this application is to utilize the sensor then the user is limited to the user application, because not every smartphone has the required sensor on this application , therefore it would be better if later this application is developed by using the API provided by google to get the value of temperature, and humidity.

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